ABSTRACT

Given a set V of 2n points in the plane, the min-cost perfect matching problem is to pair up the points (into n pairs) so that the sum of the Euclidean distances between the paired points is minimized. We present an $O(n^(3/2)log^5n)$-time algorithm for computing a min-cost perfect matching in the plane, which is an improvement over the previous best algorithm of Vaidya by nearly a factor of n. Vaidya's algorithm is an implementation of the algorithm of Edmonds, which runs in n phases, and computes a matching with i edges at the end of the i-th phase. Vaidya shows that geometry can be exploited to implement a single phase in roughly $O(n^(3/2))$ time, thus obtaining an $O(n^(5/2)\log^4 n)$-time algorithm. We improve upon this in two major ways. First, we develop a variant of Edmonds' algorithm that uses geometric divide-and-conquer, so that in the conquer step we need only $O(n^(1/2))$ phases. Second, we show that a single phase can be implemented in $O(n \log^5 n)$ time.